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Interim Action Confirmation Report
Site 41 - Crescent Bluff Fire Drill Area
Fort Ord, California

Prepared for

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1.0 INTRODUCTION

The U.S. Army Corps of Engineers, Sacramento District (COE), is conducting interim actions (IAs) at Fort Ord, California, in accordance with the *Interim Action Record of Decision, Contaminated Surface Soil Remediation, Fort Ord, California* (IAROD; *HLA, 1994a*). The IAROD was signed by representatives of the U.S. Army (Army), the U. S. Environmental Protection Agency (EPA), and the California Environmental Protection Agency (Department of Toxic Substances Control [DTSC] and Central Coast Regional Water Quality Control Board).

Interim actions are being conducted at sites that were identified as IA sites during the site characterization phase of the Fort Ord remedial investigation/feasibility study (RI/FS). IA sites by definition have limited surficial soil contamination that can be addressed by excavation of soil. IAs will be implemented at sites with (1) a maximum depth of affected soil of 25 feet and (2) a limited volume of affected soil, typically less than 5,500 cubic yards. The IAROD further describes the process and the criteria for identifying and approving potential IA areas for excavations.

This confirmation report presents the results of the IA performed at Site 41, the Crescent Bluff Fire Drill Area at Fort Ord. The IA was described initially in the Army's *Approval Memorandum, Proposed Interim Action Excavation, IA Area 41, Site 41A - Crescent Bluff Fire Drill Area, Fort Ord, California* (*HLA, 1996*). The IA, including sampling, was performed by Environmental Chemical Corporation (ECC) under contract to the COE. This report was prepared by Harding Lawson Associates (HLA) under Contract DACA05-86-C-0241 in accordance with the scope of work dated July 28, 1993.

2.0 PURPOSE AND SCOPE

This confirmation report presents the information necessary to evaluate whether the IA remedial action objectives (RAOs) outlined in the IAROD and the IA approval memorandum have been met for Site 41. The RAOs for IA areas are to achieve an acceptable aggregate human health risk and to protect groundwater.

This confirmation report was prepared in accordance with the IAROD (*HLA, 1994a*) and includes the following: a summary of the initial site characterization (Section 3.0), a summary of IA activities, including results of confirmation sampling and analysis (Section 4.0), an evaluation of RAOs for the protection of human health and groundwater quality based on the analytical results of the confirmation samples (Section 5.0), and conclusions regarding the achievement of RAOs at IA Area 41A at Site 41 (Section 6.0). References cited in this report are listed in Section 7.0.

3.0 SITE CHARACTERIZATION REPORT SUMMARY

On March 22, 1996, the Army issued the *Draft Final Site Characterization, Site 41 - Crescent Bluff Fire Drill Area, Fort Ord, California* (*HLA, 1995a*). The site characterization report includes a summary of site characterization activities, a screening risk evaluation (SRE), and conclusions and recommendations. The site characterization was performed to assess the environmental conditions associated with potential sources of contamination at the site. The SRE assessed the need for further action at the site based on the results of an evaluation of potential health risks associated with site-related chemicals. The site characterization report is summarized in the following sections.

3.1 Site Characterization

Site 41 is approximately 1 mile southeast of the developed portion of the East Garrison and consists of approximately 1½ acres of land (Plate 1). The area is undeveloped and currently is not used. The area is reportedly an abandoned rock quarry. Four shallow depressions at Site 41 were suspected as former burn pits used for firefighting drills. The former burn pits were considered potential sources of contamination due to their use for fire drill practice in the 1940s and 1950s. Liquids possibly used in the burn pits include crankcase drainings, napalm, gasoline, and kerosene.

Field activities were performed in accordance with procedures described in the RI/FS Work Plan (*HLA, 1991a*), the RI/FS Sampling and Analysis Plan (*HLA, 1991b*) with modifications, Part 2 of the Draft Site Characterization of Site 34 (*HLA, 1994c)*, and the site safety and health plans (*EA, 1991*; *HLA, 1992*). Site characterization activities at Site 41 are summarized below.

3.1.1 Field Program

HLA performed a field investigation in July and September 1994 that included drilling and sampling eight soil borings within the four burn pits and collecting two additional surface samples outside of the pits (Plate 2). The borings were drilled to approximately 20 feet below ground surface (bgs). Soil

samples were collected for lithologic characterization and chemical analysis at approximately 5-foot intervals, logged in the field by a geologist, and screened with an organic vapor analyzer. Four soil samples were submitted for particle size analysis.

Forty-six soil samples were collected and analyzed for one or more of the following: total petroleum hydrocarbons (TPH) as gasoline, TPH as diesel, volatile organic compounds (VOCs), semivolatile organic compounds (SOCs), dixoins, furans, total organic carbon, and priority pollutant metals (PPMs; antimony, arsenic, beryllium, cadmium, chromium, hexavalent chromium, copper, lead, mercury, nickel, selenium, silver, thallium, and zinc). All sampling locations are shown in the *Draft Final Site Characterization, Site 41 - Crescent Bluff Fire Drill Area, Fort Ord, California* (*HLA, 1995a*).

3.1.2 Subsurface Conditions

The maximum depth explored during the investigation at Site 41 was 21 feet. In general, subsurface materials consist of yellow, brown, and gray, medium dense to very dense, fine to medium clayey sand. The particle size analysis indicated that the materials encountered between 5 and 6 feet bgs are classified as clayey sand. No groundwater was encountered during drilling.

3.1.3 Analytical Results

The following organic chemicals were detected in one or more soil samples: TPH as extractable unknown hydrocarbon, methyl ethyl ketone, methylene chloride, toluene, pentachlorophenol, bis-2(ethylhexyl)phthalate, and octachlorodibenzo-p-dioxin (OCDD). The following PPMs were detected in one or more samples: arsenic, beryllium, cadmium, total chromium, copper, lead, mercury, nickel, selenium, silver, thallium, and zinc. Three organic compounds and 11 metals detected in soil samples were considered to be site related at Site 41:

Organics	PPMs
OCCD	Arsenic
Pentachlorophenol	Beryllium
Toluene	Cadmium
	Total chromium
	Copper
	Lead
	Nickel
	Selenium
	Silver
	Thallium
	Zinc

Other chemicals either were detected below established Fort Ord background concentrations (*HLA, 1993*), and therefore were considered to be naturally occurring, or were identified as laboratory contaminants based on data validation results. All arsenic detected at depths below 1 foot were below the maximum background concentration of 5.1 mg/kg and appear to be representative of background conditions at the site. The highest observed concentrations of arsenic were generally found in the surface and near-surface samples (0 to 1.0 foot feep) and appear to be site related. Beryllium was detected consistently above background levels in several borings up to 20 feet bgs at Site 41. This consistency suggests that beryllium may be naturally occurring at the site rather than resulting from a surface or near-surface source of contamination.

TPH as unknown extractable hydrocarbon results were evaluated using results of polycyclic aromatic hydrocarbon (PAH) analyses. Because no PAHs were detected at the location corresponding to the

maximum detected concentration of TPH, the unknown hydrocarbons were not considered to represent a significant health risk.

3.2 Screening Risk Evaluation

HLA performed a screening risk evaluation (SRE), which consisted of the following:

- Comparing maximum detected concentrations of chemicals in soil to preliminary remediation goals (PRGs) to evaluate the need for further action at the site

- Evaluating potential impacts to groundwater

- Summarizing an ecological risk assessment performed for the site.

All site-related chemicals (SRCs) identified in Section 3.1.3 were evaluated in the SRE. As discussed in Section 4.1.1 of the Site 41 Draft Final Site Characterization (*HLA, 1995a*), the SRE analysis compared the highest concentration of TPH mixtures to the motor oil PRG. TPH mixtures included "high boiling point hydrocarbons" in the JMM investigation (*JMM, 1991*) and TPHd in HLA's investigation. TPH data collected after May 10, 1993, were evaluated using the results of the PAH analyses, as recommended by the EPA and DTSC (*HLA, 1994b*).

The methodology and assumptions used to develop PRGs for Fort Ord were presented in HLA's *Draft Final Technical Memorandum, Preliminary Remediation Goals, Fort Ord, California* (*HLA, 1994b*). The PRGs represent soil concentrations considered to result in estimated daily doses (1) associated with an estimated 1-in-1-million probability that an exposed individual would develop cancer (10^{-6} cancer risk) or (2) expected to be without appreciable risk of deleterious noncancer health effects (hazard quotient less than 1).

PRGs for SRCs detected in soil at Site 41 were used to assess the need for further action at the site by calculating ratios of the chemical concentrations to the PRGs. The chemical concentrations used in the ratios included:

- The maximum detected site concentration (MSC)

- The portion of the MSC attributable to background, i.e., the maximum background concentration (MBC)

- The portion attributable to site activities, i.e., the maximum site-related concentration (MSRC, equal to MSC minus MBC).

A chemical-specific ratio of less than or equal to 1 indicates that the chemical concentration is less than or equal to the PRG and, therefore, that substantial health risks are not likely to be associated with that chemical. To conservatively evaluate possible exposure to multiple chemicals, the ratios were added together to calculate a ratio sum. A ratio sum of less than 1 indicates that substantial health risks are not likely to be associated with exposure to the multiple chemicals evaluated.

Results of the SRE indicated that the MSRCs of all SRCs except arsenic and beryllium were below PRGs. The MSRC of 44.8 mg/kg for arsenic and 1.8 mg/kg for beryllium exceeded their PRGs of 0.87 and 0.39 mg/kg, respectively, resulting in a combined MSRC/PRG ratio of 56.3. Possible additive effects of all of the SRCs were evaluated by summing the chemical-specific ratios. The resulting ratio sum was 57.3, all but slightly less than 1 of which was associated with possible exposure to arsenic and beryllium. Results of this evaluation indicated that additional action at the site may be necessary to address potential health risks associated with exposure to arsenic and beryllium at Site 41.

3.2.1 Potential Groundwater Impacts

Potential impacts to groundwater from SRCs were assessed using EPA's VLEACH model to evaluate organic SRCs and a qualitative analysis to evaluate inorganic SRCs. Results of the VLEACH modeling and the qualitative analysis indicate that no significant impacts to groundwater are expected from SRCs detected at Site 41.

3.2.2 Ecological Receptors

The results of the quantitative ecological risk assessment conducted at Site 41 for mammals indicated that adverse impacts to the deer mouse or the gray fox due to chemicals at the site are unlikely (Section 6.4.2.1 of Volume IV of the *Final Baseline Ecological Risk Assessment, Remedial Investigation/Feasibility Study, Fort Ord, California* [*HLA, 1995b*]). In addition, the quantitative evaluation indicated no concern for plants due to chemicals at the site (Section 6.2.2.1 of the *Final Baseline Ecological Risk Assessment* [*HLA, 1995b*]).

3.3 Conclusions and Recommendations

In the Draft Final Site Characterization for Site 41, it was recommended that shallow soil (up to 1 foot deep) be excavated from the burn pits associated with Borings SB-41-01, SB-41-02, and SB-41-05 through SB-41-08, where samples indicated elevated levels of arsenic and beryllium (*HLA, 1995a*). Beryllium was consistently found above background levels in several borings at depths up to 20 feet bgs. This consistency suggests that beryllium may be naturally occurring at this site at the concentrations observed. The excavation of soil proposed above would remove the soil with the highest observed beryllium concentrations. Soil below the excavated areas containing beryllium above background levels would remain in place. Results of the SRE indicate that exposure to beryllium at Site 41 is not likely to exceed the 10^{-4} to 10^{-6} target cancer risk range identified for Superfund site cleanups.

Limited excavation of approximately 1 foot of soil from the burn pits associated with Borings SB-41-01, SB-41-02, and SB-41-05 through SB-41-08 was recommended for early soil excavation as part of the IAROD process at Fort Ord. These areas were recommended for excavation under the IAROD program, as discussed in Section 4.1.

4.0 INTERIM ACTION SUMMARY

This section summarizes the IA activity at Site 41, including preparation of an approval memorandum and collection and analysis of confirmation samples.

4.1 Approval Memorandum

Site characterization activities identified one IA Area, consisting of three separate excavations, at Site 41. The IA area was identified as 41A, consisting of the soil in the location of three former burn pits (Plate 2). In February 1996, the Army issued the *Approval Memorandum, Proposed Interim Action Excavation, IA Area 41A, Site 41A - Crescent Bluff Fire Drill Area, Fort Ord, California* (*HLA, 1996*). The approval memorandum defines the approximate limits of the three proposed IA excavations at IA Area 41A and details the screening process used to evaluate the IA. A site eligibility checklist that demonstrates the area's conformance with the IAROD criteria is included in the approval memorandum. The locations of the excavations for IA Area 41A are shown on Plate 3.

4.1.1 IA Area Chemicals and Target Cleanup Concentrations

The IAROD identifies an RAO for IA areas as aggregate human health risk estimates of (1) 10^{-6} excess cancer risk or lower and (2) a hazard index of 1 or less to address possible noncancer health effects. Chemical-specific PRGs developed in the Draft Final Technical Memorandum (*HLA, 1994b*) and subsequent addenda were used to address this RAO. The PRGs were used to evaluate the contribution SRCs might make to aggregate area-related health risks. SRCs contributing significantly to aggregate health risks in excess of the RAO criteria may require cleanup to target cleanup concentrations (TCCs). TCCs are developed for those chemicals contributing to exceedances of RAO criteria and represent soil concentrations that, if left in place, would achieve RAO criteria. The results of the SRE presented in HLA's Draft Final Site Characterization, Site 41A, indicated that (1) arsenic and beryllium are the only chemicals that may contribute substantially to a cancer risk exceeding the RAO criterion, (2) arsenic is the only chemical that may contribute substantially to a hazard index exceeding the RAO criterion

(Table 1), and (3) other chemicals will not contribute substantially to exceedance of the RAO criteria in IA Area 41A (*HLA, 1995a*).

An evaluation of groundwater quality under the IAROD indicates that no significant impacts to groundwater are expected from the concentrations of chemicals detected at IA Area 41A. The approval memorandum confirms the recommendation from the Draft Final Site Characterization, Site 41A, that IA Area 41A meets the criteria for early soil excavation established as part of the IAROD process at Fort Ord (*HLA, 1995a*).

4.2 IA Excavation and Confirmation Samples

IA activities at Site 41 were performed in accordance with the February 6, 1996, approval memorandum, with the following exceptions:

- Although EPA Test Method 6010A was proposed in the approval memorandum to analyze for mercury in the confirmation samples, EPA Test Method 7471 was actually used. The Environmental Chemical Corporation laboratory in Cincinnati, Ohio, which performed the analyses, opted for the latter method to decrease matrix interference and achieve lower detection limits. The remaining priority pollutant metals were analyzed for using EPA Test Method 6010A; therefore, this deviation from the methods proposed in the approval memorandum does not affect the relevance or usability of the collected data.

- The excavated burn pits were not backfilled after the excavation was complete, as was proposed in the approval memorandum. The Fort Ord wildlife biologist, Mr. William Collins of the Directorate of Environmental and Natural Resources Management, directed that the pits not be backfilled, to preserve the existing wetlands environment.

Work at IA Area 41A involved excavation of soil from the three burn pits that existed at Site 41. On June 18, 1996, rain water remaining in Burn Pit 1 was pumped out under the direction and supervision of a COE representative as instructed by Mr. William Collins. The IA excavations at Area 41A were

performed by ECC between June 26 and 27, 1996. Each excavation encompassed a burn pit, for a total volume of approximately 76 cubic yards (cy). This volume resulted from excavating the following burn pits: a 15- by 30-foot area to a depth of approximately 1 foot below ground surface (bgs) at Burn Pit 1; a 27- by 30-foot area to a depth of approximately 1 foot bgs at Burn Pit 2; and a 20- by 40-foot area to a depth of approximately 1 foot bgs at Burn Pit 3.

After the excavations were complete, six confirmation samples, two from the bottom of each excavation, were collected as recommended in the IA approval memorandum. One duplicate sample was also collected for quality control (QC) purposes. The confirmation sample locations and numbers are listed in Table 2 and shown on Plate 3. One composite soil sample was also collected from the stockpiled soil. The confirmation samples collected from the IA excavations at Area 41A were analyzed for PPMs by EPA Test Methods 6010A and/or 7000 series. The analytical results indicated that arsenic was not detected in any of the confirmation samples at a concentration greater than 3.0 mg/kg, the lab reporting limit. Other priority pollutant metals were detected at concentrations below their PRG concentrations. Analytical results of the confirmation soil samples are listed in Table 3. Complete results of the chemical analyses and copies of the chain of custody records are presented in Appendixes A and B, respectively. Results of data validation performed on the confirmation samples are presented in Appendix C.

The approximately 76 cy of soil removed from the three excavations at IA Area 41A were stockpiled at the site pending the receipt of analytical results for the composite sample collected from the stockpile. On the basis of the results, the stockpiled soil was transported to the Fort Ord landfill as instructed by the COE for use in the foundation layer of the landfill cap.

5.0 EVALUATION OF RAOS FOR HUMAN HEALTH AND THE PROTECTION OF GROUNDWATER

Analytical results of confirmation soil samples were evaluated to determine whether RAOs addressing the protection of human health and groundwater have been achieved at IA Area 41A. Six confirmation soil samples were collected at IA Area 41A. Results of chemical analyses of these samples represent chemical concentrations in soil remaining after the IA. Analytical results for the duplicate sample and composite sample from the stockpile were used for QC and waste disposal purposes, respectively, and were not included in the evaluation of RAOs. To determine whether RAOs have been achieved, maximum concentrations of potential SRCs were compared to target cleanup concentrations (TCCs) and PRGs, as discussed below.

The primary rationale for the development of IA RAOs is the reduction of risks to human health associated with chemicals at an IA area. Achievement of RAOs requires establishment of allowable concentrations (i.e., TCCs) of chemicals in surface soil. Soil having allowable concentrations of chemicals, if left in place, would not pose unacceptable risks to future residents or users of the IA area and would not adversely impact groundwater quality. TCCs are developed only for those chemicals contributing to exceedances of RAO criteria.

In the approval memorandum for the IA excavations at Area 41A, a TCC of 5.1 mg/kg was identified for arsenic in soil to address human health risks. No TCCs were identified on the basis of protection of groundwater quality because results of the SRE indicated that the RAO criteria addressing groundwater quality have already been achieved at Site 41. To determine whether RAOs have been achieved, the maximum arsenic concentration detected in confirmation soil samples from IA Area 41A was compared to the TCC for arsenic. As shown in Table 1, arsenic was not detected at or above the reporting limit of 3.0 mg/kg. Therefore, the RAO criterion for protection of human health has been achieved.

To further confirm that the RAO criterion addressing human health risks has been achieved, other potential SRCs (i.e., chemicals detected above naturally occurring or background concentrations)

detected in confirmation soil samples were identified and the maximum detected concentrations were compared to PRGs. Comparison to PRGs evaluates potential additive cancer and noncancer health effects associated with exposure to remaining concentrations of SRCs.

The only additional SRC detected at IA Area 41A is chromium. Total chromium concentrations in soil at Site 41 are considered to be present as trivalent chromium, not hexavalent chromium, because (1) hexavalent chromium was detected at low concentrations in only 3 of 525 soil samples collected during investigations at other Fort Ord sites and (2) the site history does not indicate the presence of hexavalent chromium. The maximum detected concentration of 32.8 mg/kg is well below the trivalent chromium PRG of 67,000 mg/kg. Other chemicals detected in confirmation soil samples were either detected below background (copper, lead, nickel, zinc) or are considered naturally occurring (beryllium, as described in Section 3.3). Based on the PRG comparison for chromium, the only SRC detected in confirmation soil samples, the RAO criterion addressing human health risks has been achieved.

6.0 CONCLUSIONS

Results of the confirmation sampling indicate that soil with concentrations of arsenic above the TCC of 5.1 mg/kg has been removed. No other chemicals were identified for cleanup in the IA approval memorandum. Therefore, results of the confirmation sampling and subsequent risk evaluation indicate that no further threat to human health, the environment, or groundwater is anticipated at this site and no further investigation or remediation is recommended.

7.0 REFERENCES

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